

BLOCK BUILD: Affordable Home Building and Blockchain-Based Real Estate Platform

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Abstract

BLOCK BUILD is one of those sites with two broad client groups: workless and working civil engineers and middle-class residents. The site relies on two co-operative modes. Under the first, unemployed civil engineers collaborate with middle-class residents to construct low-income houses, engineers acquiring badly needed on-site experience and working families being able to construct as of purse. In the second model, civil engineers in order—either individually or teams of civil engineers—construct houses and sell them on the platform. Buyers pay cash down for houses, and blockchain technology renders all home trading process transparent and secure. Two-cooperation model endeavors to resolve the underutilization of civil engineers issue and render houses affordable collectively and provides an equitable blockchain platform that incentivizes all parties. Technology is employed using the current web technology with secure smart contract capabilities and AES-256 encryption to deliver clients' data with transparency, automatization, and security.

Keywords: Affordable Housing, Civil Engineering, AES-256 Encryption, Blockchain, Smart Contracts

1. Introduction

Middle-class homes would love to own resplendently built houses but are hit by the nauseating double whammy of otherworldly consultancy fees and nothing entry whatsoever into tailored architecture services. Civil engineering professional career chances and affordable housing is a smoldering socio-economic problem in contemporary global urbanization at breakneck rates. Alternatively, most of the beneficiaries of civil engineering degrees get less out of gained skills because there is no avenue whereby they can put gained skills into practice. Apart from putting professional development into arrears, this incompatibility puts provision of affordable housing opportunities into arrears. This is precisely concurrent, though, with the civil engineering profession languishing idle in excess graduate production without prospect for on-site involvement, and thereby ever-present under-employment and accommodation space for practice skill gain. This is an economically out-of-balance stance for expansion where new facets of architectural singularity and generation-one engineering ability are not being taken to their limits and relatives are being provided inelastic, high-cost means of construction.

BLOCK BUILD addresses this two-sided problem with a web site integrated on blockchain technology. BLOCK BUILD offers a interface between the unemployed civil engineers and professional labourers in two types of cooperations—unemployed engineers' self-projected projects and professional labourer job postings. Smart contracts are the foundation of the system, which executes all significant transactions automatically without human intervention, and AES-256 encryption offers confidentiality to user

communications and document handling. By peer-to-peer collaboration and decentralization of trust, BLOCK BUILD will revolutionize the way people purchase, construct, and design homes

Also, the property industry continues to be marred by middleman dependency, official inefficiency, and poor transparency, such that it becomes harder for common citizens to trust and purchase home-ownership. These inefficiencies also find their roots in centralized forms of government riddled with fiddling, document loss, and corruption. There is thus a greater need more than ever before for a platform to decentralize decision-making, make it accessible and trustworthy.

Its aim is to engage young engineers and compel families to buy cheap houses at unbeatable prices without losing any designing freedom or data privacy. Within a bounded, completed, and secured environment, BLOCK BUILD will significantly enhance career-seeker engineer professionalism and residential availability. BLOCK BUILD will address this dual issue by applying the space of an integrated electronic system on blockchain technology. BLOCK BUILD makes connections between future homebuyers and city planners under two collaborative mechanisms—career-seeker engineer-commissioned design services and career-seeker engineer-managed property listings. Smart contracts are the primitives of the platform and are used to execute all the important transactions, including agreements, payments, and title transfers. AES-256 cryptography is used for confidentiality of communication and document processing at the cost of not lowering the security level of the platform.

Utilizing decentralized ledger technology and peer-to-peer co-working, BLOCK BUILD enables transparency and trust. Middleman brokers are removed and transaction process is reduced, and development and ownership are user-transparent at all levels. Platform architecture includes automation and storage layers in secure mode and thus making it universally accessible.

2. Literature Survey

The overall philosophy throughout this site is one of inclusiveness: empowering young engineers to the extent of making the family home more affordable without compromising on design innovation and data security. BLOCK BUILD had set out to move away from adaptive classical systems to a more responsive, technology-led one that would also be able to learn to adapt to change in terms of changing needs in the future. By combining innovation with its technology platform and social mission, the website will contribute significantly to housing and professional development in India and globally.

Irrelevant studies in the modern era demonstrate the path to the promise of blockchain technology to revolutionize real estate activity with the assurance of immutability, decentralization, and trustless automation. Most of the models discussed in recent studies are progressing towards commercial or luxury real estate use with no social or education consequence.

For instance, Bărbuță and Alexandrescu [1] suggested an ownership model of property obtained via blockchain and NFT, tamper-proof asset registering. Redekar et al. [3] utilized the application of smart contracts to enroll real estate contracts without utilizing collaboration or experience-based learning.

Panwar et al. [4] have employed legal considerations of blockchain deployment, while Oza et al. [5] have authored tokenization fractional ownership. There are very few research papers that have mentioned consideration for employing unemployed engineers or property market affordability nature. BLOCK BUILD stands out among the rest because it has employed employment generation, technical expert skill development, and housing supply at community level as a part of its blockchain solution.

Further, studies by Hassan et al. [6] and Sharma et al. [7] illustrate NFTs and decentralized identification proof functionality in real estate administration—technologies that give the fulcrum to BLOCK BUILD's

proof papers and smart contract enforcement system. Such studies thus validate the platform's architectural assumption potential for its new real-world application and outreach system.

Table 2.1: The table shows the Literature Survey of block build

S. No	Name of the Author(s)	Title of the Paper	Year	Merits	Demerits
1	D.-E. Bărbuță and A. Alexandrescu	A Secure Real Estate Transaction Framework Based on Blockchain Technology and Dynamic Non-Fungible Tokens	2022	Secure and flexible property ownership transfers using dynamic NFTs; tamper-proof and transparent.	Legal and regulatory hurdles for NFT integration.
2	V. K, B. Singh J, R. K. S, V. M, V. D and S. R. B	Blockchain Enabled Real Estate Property Transactions using NFT: An Approach	2023	Enhanced fraud prevention and reduced costs via NFT-based decentralized transactions.	Scalability and interoperability challenges with existing systems.
3	S. Redekar, S. Bhagwat, K. Upasani, S. Jha and V. Thorat	Real Estate Management System using Blockchain	2024	Automated ownership verification and improved transparency using smart contracts.	Integration issues with legacy systems; requires infrastructure investment.
4	A. Panwar, U. Sugandh, N. Sharma, J. Agarwal and A. Jain	The Intersection of Blockchain and Real Estate: Opportunities, Challenges, and Future Prospects	2024	Transparency in ownership verification and reduced fraud with decentralized systems.	Regulatory challenges and integration with traditional real estate processes.
5	V. J. Oza, A. Nikte, V. Bhanushali and U. Rote	Smart Contracts and Tokenization: Revolutionizing Real Estate Transactions with Blockchain Technology	2024	Fractional ownership and automated processes via tokenization and smart contracts.	Legal compliance and adoption barriers for tokenized systems.
6	M. Hassan, M. Raafat and H. Mansour	My Real Estate: Revolutionizing Real Estate Transactions and Ownership Management with Blockchain and NFTs	2024	Streamlined processes using NFTs; improved ownership management and fraud reduction.	Scalability issues and limited awareness of blockchain-based systems.
7	A. Sharma, A. Sharma, A. Tripathi and A. Chaudhary	Real Estate Registry Platform Through NFT Tokenization Using Blockchain	2024	Tamper-proof ownership records with reduced dependency on intermediaries.	Integration difficulties with existing property laws and frameworks.

8	K. Madhura and R. Mahalakshmi	Usage of Blockchain in Real Estate Business for Transparency and Improved Security	2022	Improved transparency and fraud prevention with decentralized record-keeping.	Infrastructure requirements and limited awareness among stakeholders.
9	N. Pocha, R. Shah, Y. Shah and P. Sonawane	Decentralized One-Stop Solution for Real Estate	2023	End-to-end real estate solutions with reduced transaction costs and improved trust.	Adoption resistance and legal challenges in large-scale implementation.
10	S. Latifi, Y. Zhang and L.-C. Cheng	Blockchain-Based Real Estate Market: One Method for Applying Blockchain Technology in Commercial Real Estate Market	2021	Simplified ownership verification and secure transactions with decentralized records.	High implementation costs and regulatory barriers for commercial applications.

3. Proposed System

BLOCK BUILD has been considered to be a safe, scalable, and modular web platform with two collaboration models of real estate:

3.1 Collaborative Homebuilding Model

Middle-class buyers register on the website and promote their housing requirement—space, floors, floor plan type, and price. They are matched with degree holders in civil engineering who offer custom design and affordable construction offers. Communication and sharing is on AES-256 channel of communication, and everything is carried out under smart contracts that provide terms of payment and delivery. The model eliminates in-contact experience by engineers for what they can deliver and saves homeowners' construction consultancy expense by much.

3.2 Developer-Led Property Sales Model

In this, the local construction firms or hired civil engineers construct the completed or partially completed residential homes.

They get tokenized and placed on the Ethereum blockchain where the purchasers are able to surf, browse, and purchase houses using smart contracts. The house title is not physical, but the whole mechanism of buying or buying—from the advertisement to settlement of purchase—is on an open platform with the absence of any middlemen. It minimizes fraud risk, makes it easier to transfer property, and inculcates trust. Both collaboration patterns share the same interface, providing dashboards and status to all, with an immutable audit trail to be looked up later for legal and operational purposes of validation.

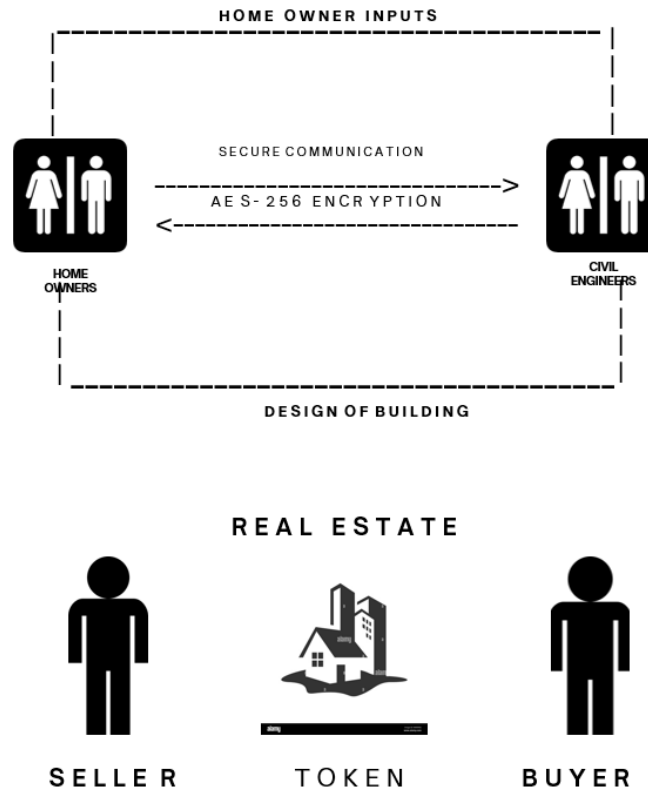


Figure 3.1 Functional Diagram of Block Build

4. Methodology

The methodology proposed here exploits ubiquitous full-stack software toolkits, blockchain protocols, and cryptography standards to provide an unbroken and tamper-evident property experience:

User Roles and Dashboards: Bound administrator, civil engineer, and homeowner interfaces. Project monitoring, messaging, and proposal acceptance form dashboards.

Project Initiation: Engineers review projects and bids on projects. Homeowners create design inputs and submit blueprints themselves to initiate projects.

Smart Contract Management: Once proposals are accepted, a smart contract is built for each milestone (i.e., 30% design, 60% review, 100% delivery) and related payments. Smart contracts are written and deployed on Ethereum test networks in Solidity.

Decentralized Storage: Files and design files are archived with IPFS in such a way that file integrity and immutability are maintained. The related smart contract ID is stamped across the file.

Real-Time Blockchain Synchronization: Upload, approvals, and transactions are synchronized in real time into the Ethereum blockchain.

Security: AES-256 encryption for messages so project files can't be accessed without authorization or cost.

This is an open, tamper-evident, and participative building and transaction process geographically scalable by geographies and housing estates.

5. Implementation

5.1 Technology Stack:

Frontend: React.js on top of Tailwind CSS for easy-to-use interfaces

Backend: Node.js and Express for managing business logic and API routing

Blockchain: Hardhat for testing and deploying smart contracts on Ethereum

Smart Contracts: In Solidity; escrow payment, design approvals, property transfer

Wallet Integration: MetaMask for real-time user authentication and transaction signing

Database: Local cache of user profiles and login history using MongoDB

File System: Design blueprints on decentralized storage with IPFS

Encryption: AES-256 encryption of chat message and all private information

5.2 Functional Implementation:

Login/Registration Module: Execute engineer login and homeowner login

Proposal Management: Engineers enter responses; homeowners approve proposals

Dashboard Interfaces: View-independent dashboard interfaces for project status, due dates, and payment history display

Smart Contract Interface: Compiler, deployer, and interface scripts of contract calls

Property Listing and Purchase Module: Tokenization, list creation, and purchase verification via MetaMask integration

Notice as well as Transaction Logs: Audit trails as well as transparency records at transaction-, communication-, as well as contract-level

It has been tested with in-browser Hardhat test networks

6. RESULTS

6.1 HOME OWNERS DASHBOARD

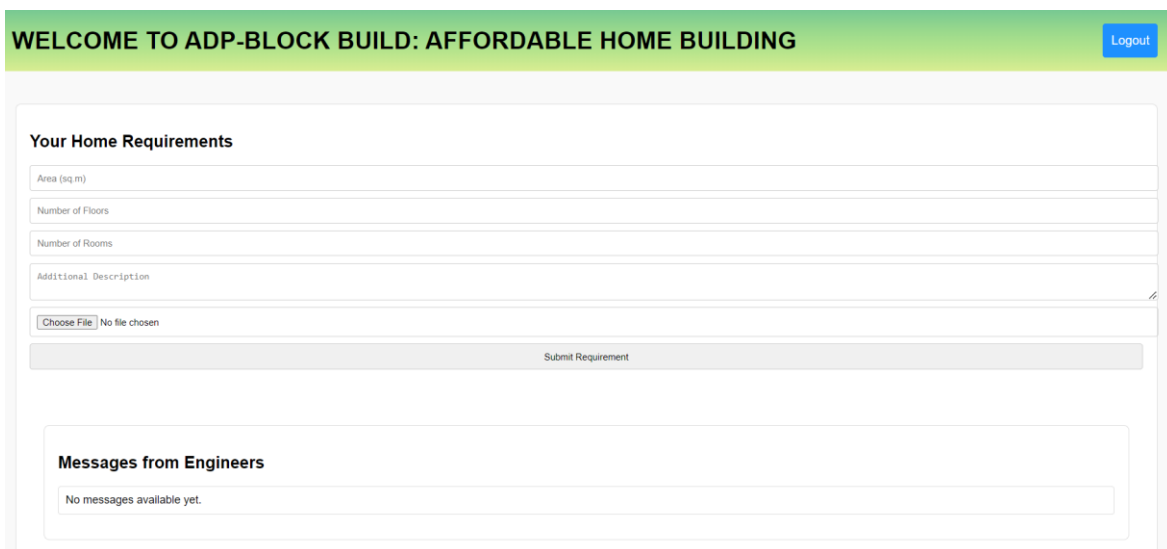
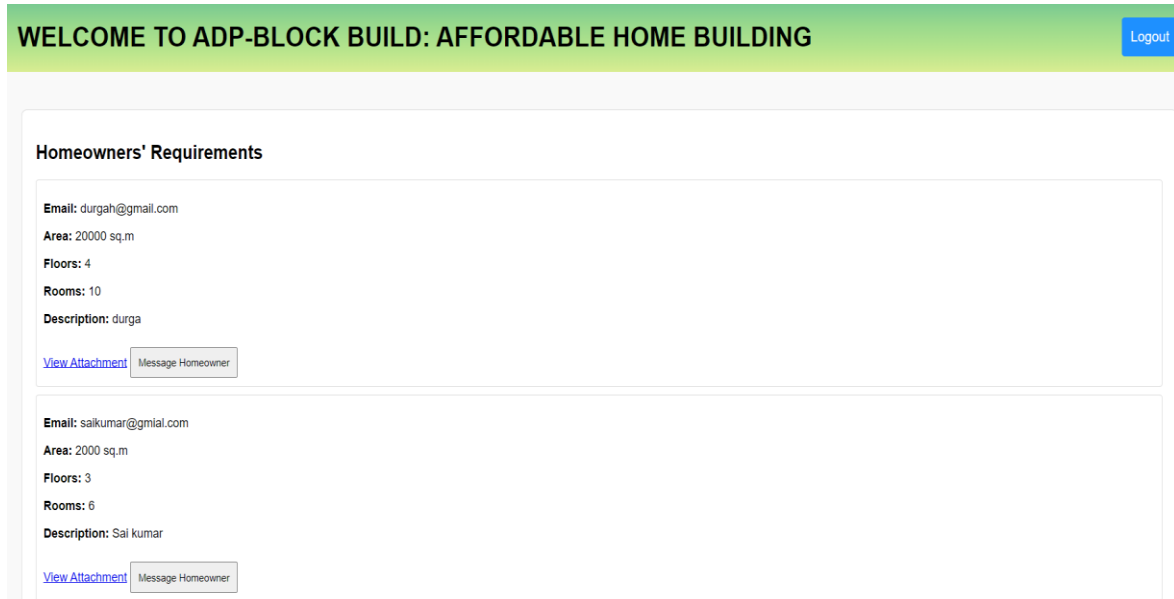


Figure 6.1 Homeowners Dashboard

Figure 6.1 contains home requirements form with input fields for area (sq ft), number of floors, number of rooms, additional description, and a file upload option.

6.2 ENGINEERS DASHBOARD



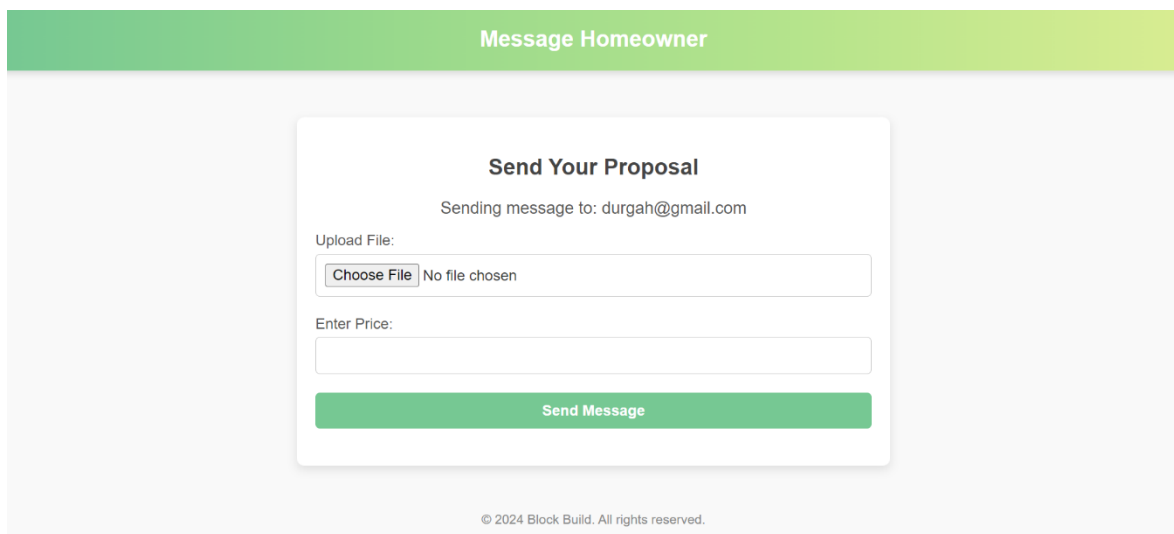
The dashboard features a green header with the text "WELCOME TO ADP-BLOCK BUILD: AFFORDABLE HOME BUILDING" and a "Logout" button. Below the header, the "Homeowners' Requirements" section lists two entries:

- Homeowner 1:** Email: durgah@gmail.com, Area: 20000 sq.m, Floors: 4, Rooms: 10, Description: durga. Includes a "View Attachment" link and a "Message Homeowner" button.
- Homeowner 2:** Email: saikumar@gmial.com, Area: 2000 sq.m, Floors: 3, Rooms: 6, Description: Sai kumar. Includes a "View Attachment" link and a "Message Homeowner" button.

Figure 6.2 Engineers Dashboard

Figure 6.2 is a dashboard showing homeowners' requirements to the engineers

6.3 MESSAGE HOME OWNER PAGE



The page has a green header with the text "Message Homeowner". The main content area contains a "Send Your Proposal" form. The form includes:

- Title: "Send Your Proposal"
- Recipient: "Sending message to: durgah@gmail.com"
- Upload File: A field with a "Choose File" button and the text "No file chosen".
- Enter Price: A text input field.
- Submit: A green "Send Message" button.

At the bottom of the page, there is a copyright notice: "© 2024 Block Build. All rights reserved."

Figure 6.3 Message Home Owner Page

Figure 6.3 contains message form for sending a proposal to a homeowner with fields for file upload and price entry.

6.4 REAL ESTATE SECTION

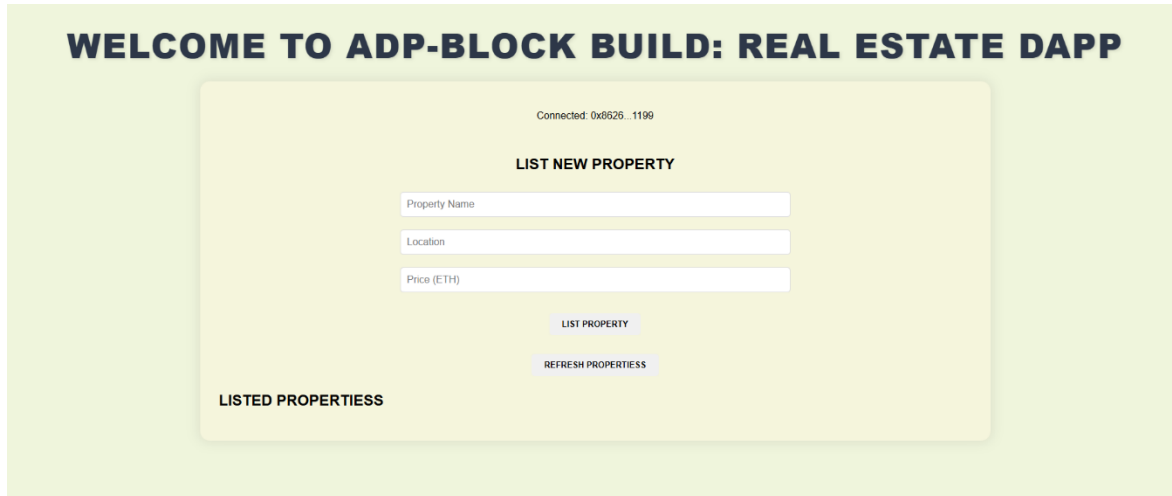


Figure 6.4 Real Estate Dashboard

Figure 6.4 is a frontend UI of a Real Estate DApp built with React. It allows users to connect their wallet, list new properties by entering the name, location, and price in ETH, and view listed properties via the "REFRESH PROPERTIES" button.

6.5 LISTED PROPERTIES

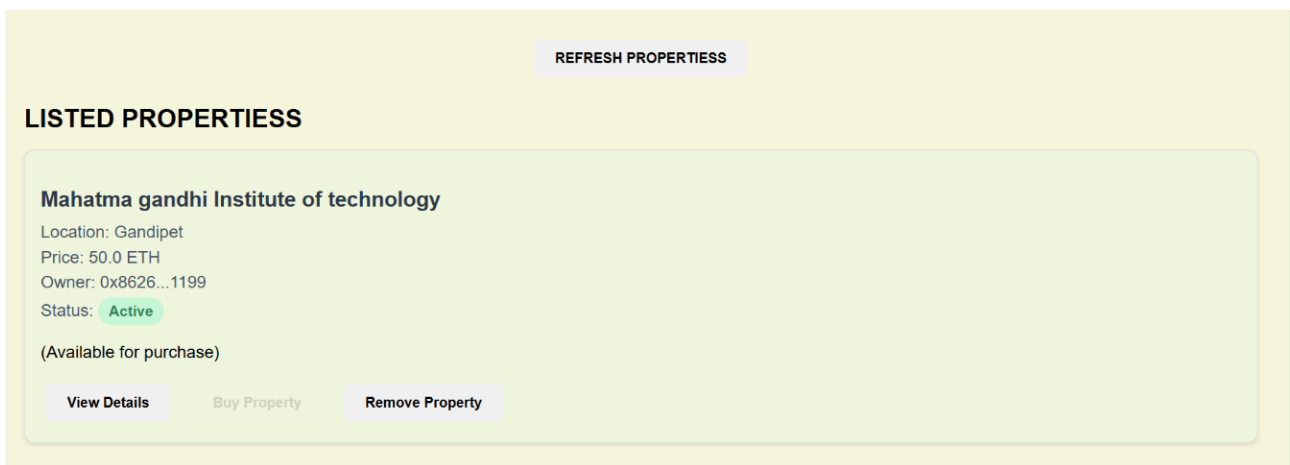


Figure 6.5 Listed properties

Figure 6.5 contains the listed properties that are ready for sale.

7. Benefits

Improved Housing Affordability: Direct communication between civil engineers as well as families eliminates brokerage as well as consulting fees.

Competency and Work and Training: Younger civil engineers gain quantifiable experience to refresh resumes and employers.

Transactions are Safe, Secure, and Transparent: Blockchain transactions and Smart contracts resolve conflict and legalize needs reduction.

Efficient Workflows: Distributed data and real-time dashboards remove delay and accelerate collaboration.

Privacy Assurances: Messages and data are AES-256 encrypted, maintaining the existing data security

standards.

Customization: Houses are built to suit the requirements of buyers instead of being built for space per se.

Safe Place: Everything—from sharing files to doing business—is in a non-editable format, giving regulators visibility and capacity.

8. Conclusion and Future Scope

BLOCK BUILD is a design project to democratize the gateway to the affordable housing and future technological advancements of next-gen civil engineering prodigies. BLOCK BUILD leverages decentralized tech, end-to-end encryption, and high-level UI/UX standards to address the economic as well as talent issues of the real estate industry with a one-size-fits-all approach.

BLOCK BUILD future projects might include:

AI hardware implementation for estimate and plan submission of proposals

Enabling AR/VR module walkthroughs to make them interactive

Government file onboarding for more proof of ownership validation

Penetration into semi-urban and rural spaces for covering all society

School collaborations for real-world training modules and engineer certification

These directions will create platform adoption, regulation simplification, and scaling technically with the vision of accessibility, transparency, and empowerment retained.

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